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## I. INTRODUCTION

Plaintiffs Board of Regents, The University of Texas System (“UT”) and 3D Systems, Inc. (“3D Systems”) respectfully submit this Opening *Markman* Brief to address those claim terms they believe the Court should construe.<sup>1</sup>

## II. THE TECHNOLOGY AT ISSUE – LASER SINTERING

Commercial laser sintering traces its roots to Carl Deckard who, at the time he conceived and reduced laser sintering to practice, was a graduate student at UT, which filed and still owns various laser sintering patents relating to Dr. Deckard’s work, including the two patents-in-suit.<sup>2</sup> Over a decade ago, early in the development of laser sintering, UT exclusively licensed its patents and other rights relating to laser sintering to an Austin, Texas start-up company called Nova Automation. Nova soon changed its name to DTM Corporation and, in August 2001, DTM was acquired by 3D Systems (who now is the exclusive licensee of those rights).

DTM introduced the first commercial laser sintering machine to the world in the early 1990s, and worked diligently to obtain industry acceptance of this new, revolutionary technology. Laser sintering, pioneered by UT and DTM, is one of the fastest growing segments of the rapid prototyping technologies that use an additive, or layer-by-layer, manufacturing technique. EOS became involved in laser sintering only after seeing the DTM machines and, not surprisingly, the EOS machines look and work very similarly to the DTM machines.<sup>3</sup>

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<sup>1</sup> A claim chart summarizing plaintiffs’ proposed constructions is attached as Exhibit A. Other terms that plaintiffs understand EOS will urge the Court to construe will not be addressed in this Brief, but rather in plaintiffs’ Response Brief to be filed on November 10, 2003 (which will also include a chart showing both parties’ proposed constructions of disputed terms).

<sup>2</sup> Copies of these patents, U.S. Patent Nos. 5,639,070 (the “‘070 patent”) and 5,597,589 (the “‘589 patent”), are attached as Exhibits 1 and 2 to the concurrently filed Declaration of Robert W. Dickerson.

<sup>3</sup> EOS spent significant time during the October 17 tutorial discussing the Housholder patent that issued in 1981. (*See* Dickerson Decl., Ex. 12 (copy attached).) While a second embodiment of that patent does disclose the basic elements of laser sintering, a working laser sintering machine was never built by Housholder or anyone else based upon his “paper patent” disclosure. Moreover, because Housholder never actually built a machine, he neither knew about

As illustrated during the October 17 tutorial, a laser sintering system begins its operation by dispersing a layer of powder into a confinement structure, often referred to as a “part bed.” (Slide No. 20.)<sup>4</sup> This layer of powder is sintered or fused together when the heat energy from a laser beam is traced across the surface of the part bed, causing the top layer of powder to fuse in the shape of the first cross-sectional layer or “slice” of the object being built. (Slide No. 15.) Next, a thin layer of powder is uniformly spread across the part bed, over the just-fused layer. (Slide No. 40.) This second powder layer is then sintered by the laser beam in the shape of the next cross-sectional layer or “slice” of the object being built, and the process of depositing and sintering powder is repeated layer-by-layer until the article is fully constructed. (Slide No. 17.) The entire part bed, including both sintered and unsintered powder, is removed from the machine, and the part is removed from the unsintered powder and cleaned. (Slide No. 18.)

### **III. THE PROBLEMS IN THE ART AND THE PATENTED SOLUTIONS**

#### **A. The Problems**

The patents-in-suit address three problems or goals encountered in early laser sintering development work: (i) the need to dispense unsintered powder for each new layer as evenly and as quickly as possible; (ii) a temperature difference that was *too great*, at the interface between powder that had just been fused and was quite hot, and the next layer of unfused powder being spread over the surface of the article being built; and (iii) a temperature difference that was *too small*, at the interface between layers that had been sintered and the surrounding unsintered

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(continued...)

curl or growth, nor did he teach how to prevent them. UT and DTM truly were pioneers in the laser sintering technology that is successfully practiced worldwide today, and EOS subsequently followed the path blazed by them, and not Mr. Housholder.

<sup>4</sup> Copies of the slides referenced are attached as Exhibit 3 to the Dickerson Declaration.

powder, sometimes deep in the powder bed. Of these three problems, plaintiffs believe that only the two temperature problems and the patented solutions addressing them are relevant here.<sup>5</sup>

The first temperature problem encountered in laser sintering causes “undesirable shrinkage” (or “curl”) during formation of a laser sintered part.<sup>6</sup> This curl takes place where powder that has just been fused (and is therefore quite hot) comes into contact with the next layer of newly deposited, unfused powder spread over the surface of the article being built. Because the new powder has to be cool enough to be spread thinly and uniformly, its relatively cooler temperature when placed on top of hot, just-sintered powder causes the unsintered powder to immediately start to draw heat from the just-sintered material. When this happens, the top of the just-sintered layer cools faster than its bottom and creates stress, which is relieved by article distortion or a curling up of the layer. (Slide Nos. 29-31.)

The second temperature problem encountered in laser sintering is called “growth.” This phenomenon does *not* occur at the interface between the just-sintered layer and the newly deposited layer of powder, but deeper within the part bed at the interface between the layers that have been sintered and the surrounding unsintered powder. When the accumulated bulk temperature of an article being formed gets too high during the build process, powder around the

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<sup>5</sup> The patents-in-suit disclose two alternatives for dispensing new powder: (i) the use of a hopper; and (ii) the use of a counter-rotating drum. (See Figs. 1, 9 & 10.) The EOS machines accused of infringement use a hopper-type mechanism to dispense powder, and not the counter-rotating drum mechanism. Thus, plaintiffs have not asserted infringement of those claims in the patents-in-suit which are drawn specifically to the drum mechanism and its method of use. (*E.g.*, ‘070 patent, claim 8.)

<sup>6</sup> “Undesirable” shrinkage that results in part deformity is different from the natural shrinkage in volume that occurs when a powder is sintered and the individual powder particles are fused into a cohesive mass. Natural shrinkage can be compensated for by increasing the “build” dimensions of the article, ending up with a final part that, after shrinking as expected, has the desired dimensions. Although the patents-in-suit use the phrase “undesirable shrinkage” instead of “curl,” Dr. Stucker testified at the October 17 tutorial that they were synonymous and that the industry had come to use the word “curl” to describe the phenomenon. EOS’s presentation at the tutorial, as shown in its Exhibit 7, similarly treated the terms as synonymous. Thus, to avoid confusion with natural shrinkage, this Brief uses the term “curl” instead of “undesirable shrinkage.”

sides of sintered layers can become hot enough to become fused, which causes the part to “grow” into the unfused powder in the part bed.

## B. The Solutions

Although “curl” and “growth” are both temperature-related problems, that is where their similarity ends.<sup>7</sup> Curl is the result of *too little heat* in the newly deposited powder, resulting in *too great a difference* in temperatures at the interface between that layer and the previously sintered layer — or, the “Curl Interface.” (See Dickerson Decl., Ex. 4.)<sup>8</sup> The Curl Interface is at the top of an article being built, where the just-sintered and newly deposited layers of powder come into contact. In contrast, growth is caused by *too much heat* in the unsintered portions of the powder within the part bed, resulting in *too small a difference* in temperatures at the interface between the sintered and unsintered portions of the powder within the part bed — or, the “Growth Interface.” (*Id.*) The Growth Interface extends deep within the part bed, where surfaces of a sintered article remain in contact with unsintered powder. In short, the solutions to these two problems had to be different because (i) the location of these temperature problems is different, and (ii) preventing these problems requires heat to be **added** to the Curl Interface but bulk heat to be **removed** from the Growth Interface.

EOS will urge the Court to adopt constructions that would limit the claims to apparatus and methods that address both curl and growth problems at the same time, which is evident from

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<sup>7</sup> The patents-in-suit recognize the difference. Curl is described as follows: “Undesirable shrinkage of the article being produced has been observed to occur due to differences between the temperature of the particles not yet scanned by the directed energy beam and the temperature of the previously scanned layer.” (‘070 patent, col. 6:38-42; ‘589 patent, col. 6:43-47). Growth is described separately as follows: “[R]emov[ing] bulk heat from the article being produced, thereby reducing its bulk temperature preventing the article from growing into the unsintered material.” (‘070 patent, col. 6:49-54; ‘589 patent, col. 6: 54-59).

<sup>8</sup> Although the patents-in-suit do not use the terms “Curl Interface” and “Growth Interface,” these shorthand terms have been coined for convenience, and are graphically shown in Exhibit 4. The part shown and the representation of growth on that part is the same depiction that EOS presented to the Court as its Exhibit 8 at the October 17 tutorial.



EOS's argument at the October 17 tutorial that the patents-in-suit solve temperature problems with a "downdraft system." Certainly, the patents-in-suit disclose a downdraft system as their preferred embodiment. ('070 and '589 patents, Fig. 11.) That system includes a heater and a fan/exhaust system for moving heated air to the Curl Interface, and also down through the part bed, past the Growth Interface. Because it produces air that is at a temperature *above* that of the cooler, newly deposited powder, but *below* that of the sintering temperature of the powder, that air works both to add heat at the Curl Interface (which lessens the temperature difference there), and to remove heat at the Growth Interface (which increases the temperature difference there).

Yet the claims themselves are directed to the problems of curl and growth separately and independently.<sup>9</sup> EOS's attempt to have the Court re-write the claims because the preferred embodiment solves both problems runs afoul of five fundamental tenets that guide proper claims construction here:

1. Method claims drafted in "steps of" rather than "steps for" format are not presumed to be "step-plus-function" claims, construed under 35 U.S.C. § 112, ¶ 6;
2. Claim terms have their ordinary meanings unless otherwise defined, and must be viewed in context with other language in the claim;
3. Limitations from the specification are generally not imported into the claims;
4. Under the doctrine of claim differentiation, different claims are presumed to have different scope; and
5. There must be a clear and unmistakable disavowal of claim scope to limit scope based upon statements made during prosecution, and inaccurate, inconsistent,

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<sup>9</sup> For instance, the "heating" step disclosed in independent claim 1 and dependent claims 3 and 4 of the '070 method patent is directed at solving the curl problem, while "exhausting" — an additional step added to the method claimed in claims 1, 3 and 4 — is disclosed in claims 5 and 6 and adds the step that addresses the growth problem.

ambiguous and gratuitous statements made by the patent applicant do not constitute such disavowal.<sup>10</sup>

#### IV. PROPOSED CONSTRUCTION OF THE “HEATING” STEP LIMITATION IN CLAIM 1 OF THE ‘070 PATENT

Claim 1 of the ‘070 patent appears below, with the claim language plaintiffs propose for construction highlighted in bold:

1. A method of producing a part from a powder, comprising the steps of:

depositing a first layer of the powder at a target surface;

directing energy at selected locations of said first layer of powder corresponding to a first cross-section of the part to fuse the powder threat, with unfused portions of the first layer of powder remaining in place;

depositing a second layer of powder over both fused and remaining unfused portions of said first layer of powder after said directing step, so that the second layer of powder is supported by fused and remaining unfused portions of said first layer of powder;

after the depositing step, **heating the second layer of powder to a temperature below the sintering temperature of the powder, to moderate a temperature difference between the second layer of powder and fused portions of the first layer of powder therebeneath;** and

directing energy at selected locations of said second layer of powder corresponding to a second cross-section of the part to fuse the powder threat, and so that fused powder at one of said selected

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<sup>10</sup> EOS’s claim construction analysis necessarily focuses on a preferred embodiment and the objectives of the invention set forth in the written description, while blurring if not ignoring entirely these basic claims construction principles. See *Anchor Wall Sys., Inc. v. Rockwood Retaining Walls, Inc.*, 340 F.3d 1298, 1306-07 (Fed. Cir. 2003) (“[T]he mere fact that the patent drawings depict a particular embodiment of the patent does not operate to limit the claims to that specific configuration.”); *Crossroads Sys. (Texas), Inc. v. Chaparral Network Storage, Inc.*, Case No. 00CA 217SS, at 2 (W.D. Tex. Jul. 27, 2000) (“The specification and file history, however, are not substitutes for the plain language of the claims.”) (Dickerson Decl., Ex. 14 (copy attached)); *Sunrace Roots Enter. Co. v. SRAM Corp.*, 336 F.3d 1298, 1304 (Fed. Cir. 2003) (where specific claims do not recite all of the stated goals, “the written description should not be used to narrow the ordinary meaning of the claim limitation”); *Resonate Inc. v. Alteon Websystems, Inc.*, 338 F.3d 1360, 1367 (Fed. Cir. 2003) (where a written description sets out two different problems present in the prior art, it is not necessary that the invention claimed, and thus every claim in the patent, address both problems).

locations of said second layer of powder fuses to fused powder in said first layer.

Plaintiffs' Proposed Construction: The highlighted phrase should be construed to mean: “adding heat to increase the temperature of the second or newly deposited layer of powder to a temperature below the sintering temperature of the powder, to moderate or lessen a temperature difference between the second or newly deposited layer of powder and the fused portions of the layer of powder directly beneath.” Any of the well-known triad of ways to heat — via convention, conduction or radiation — would be included within “heating.”

EOS's Proposed Construction: EOS has indicated its belief that this method limitation should be construed such that it must utilize the entire downdraft system shown in Figure 11 of the patent, including not only the heater, but also the fan and exhaust system.

**A. The Heating Step Limitation of Claim 1 Is Not In “Step-Plus-Function” Format, and Should Not Be Construed Under 35 U.S.C. § 112, ¶ 6.**

EOS contends that the requirements of 35 U.S.C. § 112, ¶ 6 should guide the construction of the heating step limitation in claim 1.<sup>11</sup> However, the method claims of the '070 patent do not use the “step for” language that is the hallmark of a step-plus-function claim limitation. Instead, claim 1 recites a method “comprising the steps *of*” and not “comprising the steps *for*.” Thus, there is no presumption that Section 112, paragraph 6 applies here. *See Masco Corp. v. United States*, 303 F.3d 1316, 1326-27 (Fed. Cir. 2002) (the step-plus-function rule is not presumed where the claim language used is “steps of” instead of “steps for”); *Seal-Flex, Inc. v. Athletic Track & Court Constr.*, 172 F.3d 836, 849 (Fed. Cir. 1999) (Rader, J., concurring) (using the

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<sup>11</sup> Means-plus-function or steps-for-function claims are to be construed “to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.” 35 U.S.C. § 112, ¶ 6.

phrase “step of” tends to show that § 112, ¶ 6 does not govern the limitation).<sup>12</sup> Further, absent “step for” language, a step-plus-function construction would be improper unless EOS could show that the claim language merely cites to the underlying function without setting forth the acts for performing the function. *Masco Corp.*, 303 F.3d at 1327. Because claim 1 recites the act for performing the function — and even directs how the act should be done (*i.e.*, “heating the second layer of powder to a temperature below the sintering temperature of the powder”) in order to achieve the underlying function of moderating a temperature difference at the Curl Interface — construing the ‘070 method claims as step-plus-function limitations under Section 112, paragraph 6 would be erroneous.<sup>13</sup>

**B. Plaintiffs’ Proposed Construction Uses the Ordinary Meaning of the Term “Heating” and Is Consistent with the Surrounding Text, Whereas EOS’s Construction Ignores the Context and Would Rewrite “Heating” to Also Mean “Cooling.”**

“The terms used in the claims bear a ‘heavy presumption’ that they mean what they say and have the ordinary meaning that would be attributed to those words by persons skilled in the relevant art.” *Texas Digital Sys. v. Telegenix, Inc.*, 308 F.3d 1193, 1202-03 (Fed. Cir. 2002) (citations omitted); *see also Crossroads Sys.* at 2 (“The words of the claims are generally given their ordinary and customary meaning, unless the patentee intended to use a ‘special definition of the term clearly stated in the patent specification or file history.’”) Thus, the meaning of a term as ordinarily understood by one skilled in the art controls unless clear evidence indicates that the inventor intended a different meaning. *Teleflex, Inc. v. Ficosa North Am. Corp.*, 299 F.3d 1313,

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<sup>12</sup> Not surprisingly, step-plus-function claims are rare. Kahrl, Robert C., *Patent Claim Construction* § 8.01 n.3 (1st ed. 2001) (“Indeed, the use of step plus function claiming is rare; the Federal Circuit apparently has never construed a claim with a step plus function element.”).

<sup>13</sup> A method claim does not implicate the step-plus-function rule simply because there is an apparatus claim in the same patent that is in means-plus-function form. *O.I. Corp. v. Tekmar Co.*, 115 F.3d 1576 (Fed. Cir. 1997). Thus, the mere fact that the ‘589 patent includes means-plus-function claim limitations is irrelevant in deciding proper construction of the ‘070 patent claims.

1327 (Fed. Cir. 2002). The most recent Federal Circuit cases now instruct that to determine the ordinary and customary meaning of a disputed claim limitation, objective resources such as dictionaries, encyclopedias and treatises should be consulted. *See Texas Digital*, 308 F.3d at 1202-03. In addition to a claim limitation's plain meaning, the context of the surrounding words must also be considered in determining its meaning. *Arlington Indus., Inc. v. Bridgeport Fittings, Inc.*, 2003 U.S. App. LEXIS 19719, at \*11 (Fed. Cir. Sep. 25, 2003); *Brookhill-Wilk 1, LLC v. Intuitive Surgical, Inc.*, 334 F.3d 1294, 1299-1300 (Fed. Cir. 2003).

Here, the ordinary meaning of "heat" is "to become warm or hot." *Webster's Ninth New Collegiate Dictionary* (1985) at 559. (Dickerson Decl., Ex. 5.) Thus, "heating" means to add heat so that the thing being heated becomes warm or hot. The corresponding text in the claim limitation makes clear that the thing being heated is "the second layer of powder" and that it is heated "to a temperature below the sintering temperature of the powder" so as to moderate (or lessen) the temperature difference at the Curl Interface.<sup>14</sup> This further confirms that "heating" can only mean adding heat since this temperature difference can only be moderated or lessened by adding heat to the cooler, newly deposited powder.

In sum, the plain meaning and the context of the actual claim language confirms that "heating" means just what it says — adding heat to increase the temperature of the thing being heated. It does not mean and cannot include cooling or removing heat. EOS's proposed construction ignores this plain meaning by urging that the "heating step" limitation must include the *removal of bulk heat* at the Growth Interface. By arguing that the "heating" extends past the Curl Interface, down into the part bed, EOS asks the Court to ignore the express claim language

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<sup>14</sup> The ordinary meaning of "moderate" is "to lessen the intensity or extremeness of <the sun *moderated* the chill>." *Webster's Ninth New Collegiate Dictionary* (1985) at 762 (emphasis in original). (Dickerson Decl., Ex. 6.)

that not only says “heating” but also specifies *what* gets heated, *why* it gets heated, *where* it gets heated and *how much* it gets heated.

**C. Plaintiffs’ Proposed Construction Is Consistent With Other Claims and the Doctrine Of Claim Differentiation, But EOS’s Is Not.**

Claims must be interpreted in light of other claims in the same patent. *Tandon Corp. v. U.S. Int’l Trade Comm’n*, 831 F.2d 1017, 1023 (Fed. Cir. 1987). Here, dependent claims 3 and 4 in the ‘070 patent further define the heating step of claim 1 as follows:

3. The method of claim 1, wherein said heating step heats the powder at the target surface.
4. The method of claim 3, wherein said heating step comprises:  
heating a gas;  
and directing the heated gas.

These claims demonstrate that “cooling” is not part of the heating step of claim 1, thus supporting plaintiffs’ proposed construction.

Moreover, the doctrine of claim differentiation presumes that there is a difference in meaning and scope when different words or phrases are used in separate claims. *See Tandon Corp.*, 831 F.2d at 1023 (“To the extent that the absence of such difference in meaning and scope would make a claim superfluous, the doctrine of claim differentiation states the presumption that the difference between claims is significant.”). This presumption is especially strong where the limitation in dispute is the only meaningful difference between an independent and dependent claim, and one party is urging that the limitation in the dependent claim be read into the independent claim. *See Sunrace Roots*, 336 F.3d at 1303; *see also Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1326 (Fed. Cir. 2003) (finding an independent claim not limited to the use of a particular type of material where a nearly identical claim differed only by its express limitation regarding the use of that material).

Here, EOS contends that the “heating” step in claim 1 should be construed to include using the entire downdraft system, which consists of not only a heater, but also a fan/exhaust system. But, claims 4 and 5 separately provide for the use of the fan and exhaust mechanisms:

4. The method of claim 3, wherein said heating step comprises:  
heating a gas;  
and directing the heated gas.
5. The method of claim 4, further comprising:  
exhausting directed heated gas from said target surface.

Because EOS’s proposed construction reads these dependent claim limitations into the heating step of independent claim 1, it violates the doctrine of claim differentiation, and claim 1 must be construed to include any type of heater that will heat the top layer of powder at the Curl Interface.<sup>15</sup>

**D. Because The Patent Applicant Did Not Otherwise Define “Heating” or Clearly and Unmistakably Disclaim its Plain Meaning, EOS Cannot Import Additional Limitations Into the Claim to Modify its Plain Meaning.**

The written description supports a “plain meaning” construction of “heating” because the patentee here did *not* act as his own lexicographer and clearly set forth an explicit definition of “heating” that is inconsistent with its ordinary meaning.<sup>16</sup> Nor did the patentee expressly disclaim any particular meaning of “heating” in the specification or the prosecution history.<sup>17</sup> To the contrary, the written description teaches how and where curl occurs (‘070 patent, col. 6:38-

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<sup>15</sup> Moreover, claim 5 is not another limitation to the heating step, but rather adds a separate step entirely to the overall part-building method — namely, the step of exhausting heated gas. The ordinary meaning of “exhaust” is “2 a: to draw off or let out completely; b: to empty by drawing off the contents; *specif*: to create a vacuum in.” *Webster’s Ninth New Collegiate Dictionary* (1985) at 434 (emphasis in original). (Dickerson Decl., Ex. 7.) Thus, in addition to the fact that the ordinary meaning of “heating” does not require “exhausting,” claim 5 establishes that “exhausting” is not part of the “heating” limitation in the ‘070 patent.

<sup>16</sup> See *Texas Digital*, 308 F.3d at 1204 (“the presumption in favor of a dictionary definition will be overcome where the patentee, acting as his own lexicographer, has clearly set forth an explicit definition of the term different from its ordinary meaning”).

<sup>17</sup> See *ACTV, Inc. v. Walt Disney Co.*, 2003 U.S. App. LEXIS 20498, at \*22 (Fed. Cir. Oct. 8, 2003) (the plain meaning presumption “will also be rebutted if the inventor has



42) and how one aspect of the preferred embodiment disclosing the downdraft system avoids that problem (*id.*, col. 6:46-49), and it discloses a “resistance heater” for heating air to heat up the top layer of powder particles to be sintered. (*Id.*, col. 6:60-61.)

The prosecution file history similarly lacks a disclaimer of the ordinary meaning of the “heating” limitation.<sup>18</sup> Initially, the patent applicant explained that the heating step moderated the temperature difference at the Curl Interface “to reduce thermal shrinkage [or curl] in the articles being produced.” (Dickerson Decl., Ex. 8 at 1; Ex. 9 at ‘070 0136-37.)<sup>19</sup> During later prosecution, however, the applicant twice repeated the statement that, in effect, issued claim 1 accomplished the additional goal of preventing growth of an article by removing bulk heat from the article. (*Id.*, Ex. 8 at 1-2; Ex. 9 at ‘070 0167, ‘070 0178.) Then later, in yet other statements, the applicant twice clarified that issued claim 6 (relating to exhausting heated gas) actually provides the benefit of bulk heat removal. (*Id.*, Ex. 8 at 2; Ex. 9 at ‘070 0171, ‘070 0182.) In short, the applicant’s initial statements attributing to claim 1 the goal of preventing growth are both inaccurate and are irreconcilable with his later statements. Thus, they are “at best ambiguous” and cannot constitute a clear and unmistakable surrender of claim scope. *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352, 1359 (Fed. Cir. 2003) (“The statement is amenable to multiple reasonable interpretations and it therefore does not constitute a clear and unmistakable surrender[.]”); *Northern Telecom Ltd. v. Samsung Elec. Co.*, 215 F.3d 1281, 1293-95 (Fed. Cir. 2000) (concluding that “confusing statements in the prosecution history simply fail

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(continued...)

disavowed or disclaimed scope of coverage, by using words or expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope”).

<sup>18</sup> A chart listing the pertinent statements made by the applicant to the Patent Office during prosecution of the ‘070 patent is attached as Exhibit 8 to the Dickerson Declaration.

<sup>19</sup> The parties have adopted an identification system for relevant prosecution histories that include the patent number (*i.e.*, ‘070), and sequential page numbers for that patent file history (*i.e.*, 0136-37).



to overcome the ordinary meaning” of claim language); *IMS Tech., Inc. v. Haas Automation, Inc.*, 206 F.3d 1422, 1439 (Fed. Cir. 2000) (ambiguity in patentee’s statements did not constitute a clear disavowal of claim coverage).

Further, in addition to the plain meaning of “heating” (which by definition cannot prevent growth), claim 1 cannot be enabled or interpreted to prevent growth because (i) one skilled in the art would know that simply adding heat at the Curl Interface could not also remove heat, and (ii) the exhausting step necessary to prevent growth is expressly claimed later in dependent claim 6. Thus, because the plain meaning of the claim language and the patentee’s statements regarding claim 6 are completely inconsistent with his earlier statement that issued claim 1 also prevents growth, the earlier statement is ignored when construing claim 1:

Cisco’s use of the prosecution history to narrow the meaning of claim 1 is also misplaced. During prosecution, the patent applicants state that in the invention as recited in claims 1, 11 and 18, the instance of network policy and the policy identification information are both cached. While on its face this statement appears to limit claim scope, it cannot do so absent some claim language referring to the caching of the instance of network policy. The prosecution history statement describes generally the features of the claimed invention and erroneously suggests that the independent claims include a cache for the instance of network policy. The applicants’ inaccurate statement cannot override the claim language itself, which controls the bounds of the claim.

*Storage Tech. Corp. v. Cisco Sys., Inc.*, 329 F.3d. 823, 832 (Fed. Cir. 2003).

At bottom, the Court should reject EOS’s attempt to recast claim 1 of the ’070 patent as a step-plus-function claim and, based on that error, to re-write the claim in a way that would fundamentally alter its plain meaning. The “heating” limitation should be construed according to its ordinary meaning: simply adding heat, by any means, to the unsintered powder at the Curl Interface in order to lessen the temperature difference between the unsintered powder there and the sintered powder directly beneath it.

V. **PROPOSED CONSTRUCTION OF THE “TEMPERATURE CONTROL MEANS” LIMITATION IN CLAIM 1 OF THE ‘589 PATENT**

Claim 1 of the ‘589 patent is set forth below, with the claim language plaintiffs propose for construction highlighted in bold:

1. An apparatus for producing a part from a powder, comprising:

means for successively dispensing a plurality of layers of powder at a target surface;

an energy source;

a controller for directing the energy source at locations of each dispensed layer of powder at the target surface corresponding to cross-sections of the part to be produced therein and fusing the powder thereat; and

**temperature control means for moderating the temperature difference between unfused powder in a topmost layer of powder at the target surface and fused powder in the one of the plurality of layers of powder immediately beneath the topmost layer.**

Plaintiffs’ Proposed Construction: The “temperature control means” limitation means a heater and its equivalents that increase the temperature of the unfused powder in a topmost layer of powder at the target surface to moderate or lessen the temperature difference between the unfused powder in the topmost layer of powder and fused powder in a layer immediately below.

EOS’s Proposed Construction: EOS has indicated it will propose that this claim limitation be construed to require each of the components of the downdraft system shown in Figure 11 of the patents-in-suit, including the support, the filter medium, the porous medium, the fan and/or vacuum, the plenum, and the resistance heater.

A. **Although Subject to 35 U.S.C. §112, ¶ 6, “Temperature Control Means” Must Be Construed in Terms of the Precise Function it Performs, Which Is To Heat the Newly Deposited Powder, And Not to Cool the Part Bed.**

Unlike the “heating” limitation in the ‘070 patent, the “temperature control means” limitation is drafted in a “means-plus-function” format and is therefore subject to 35 U.S.C.

§ 112, ¶ 6, which subjects the '589 patent claims to a different, and more restrictive, construction analysis than the claims in the '070 patent.<sup>20</sup> Under Section 112, paragraph 6, the first step to construing the “temperature control means” limitation is to identify just what function is performed by the “temperature control means.” See *Micro Chem., Inc. v. Great Plains Chem. Co., Inc.*, 194 F.3d 1250, 1258 (Fed. Cir. 1999). After that precise function is identified, the next step is to determine the corresponding structure, and *only* that structure, that is necessary to perform the function. See *Northrop Grumman Corp. v. Intel Corp.*, 325 F.3d 1346, 1352 (Fed. Cir. 2003) (“A court may not import into the claim features that are unnecessary to perform the claimed function.”); *Chiuminatta Concrete Concepts, Inc. v. Cardinal Indus., Inc.*, 145 F.3d 1303, 1308-09 (Fed. Cir. 1998) (where the written description elaborated on the structure and the preferred embodiment contained additional structural aspects in ways that were unrelated to the recited function, it was error to read those additional structural elements into the claim because they were not necessary to perform the claimed function).

Here, the express, recited function of “temperature control means” is “for moderating the temperature difference between unfused powder in a topmost layer of powder at the target surface and fused powder in one of the plurality of layers of powder immediately beneath the topmost layer.” ('589 patent, claim 1.) Staying true to the plain meaning of the claim language and its express words, as well as the context of the surrounding claim language, the claimed function thus requires moderating or lessening the temperature difference between the top, cooler layer and the lower, hotter layer at the Curl Interface.<sup>21</sup>

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<sup>20</sup> Although the patents have a common ancestry and their specifications are largely identical, they contain different claims and present different claims construction issues. For example, the '070 patent has only “method” claims in “steps of” format. In contrast, the '589 patent has only “apparatus” claims, some of which have “means-plus-function” limitations that are subject to construction under 35 U.S.C. § 112, ¶ 6.

<sup>21</sup> See *ACTV, Inc.*, 2003 U.S. App. LEXIS 20498, at \*11 (“When identifying the claimed function, this court has noted that § 112 6 [sic] ‘does not permit limitation of a means-plus-

Certainly, the specification describes how heat transfer from the entire downdraft system (i) moderates the temperature of the top layer of particles to be sintered and controls the mean temperature of the top layer, and (ii) removes bulk heat from the article being produced, thereby reducing its bulk temperature and preventing the article from growing into the unsintered material. ('589 patent, col. 6:54-59). But, claim 1 only relates to the first objective, directed to heating the top layer of powder to moderate or lessen the temperature difference at the Curl Interface. In deciding what function is claimed by the “temperature control means,” no extra or different function — such as “*and for removing the bulk heat from the part bed of the part being produced*” — can be imported into the expressly recited claim function without fundamentally altering what the claim language expressly requires, adopting a function different from that explicitly recited in the claim (contrary to *ACTV, Inc.*, 2003 U.S. App. LEXIS 20498, at \*11; *Generation II Orthotics*, 263 F.3d at 1363), and impermissibly reading goals of the disclosed invention into the claim language (contrary to *Sunrace Roots*, 336 F.3d at 1304; *Resonate Inc.*, 338 F.3d at 1367; *Honeywell, Inc. v. Victor Co. of Japan, Ltd.*, 298 F.3d 1317, 1325-26 (Fed. Cir. 2002)).

The written description supports the ordinary meaning of the recited functional language. There is no indication in the written description that the patentee acted as his own lexicographer and clearly set forth an explicit definition of the disputed claim term or otherwise defined “temperature control means.” Nor is there any express disclaimer of a particular meaning of the recited functional language even though the patentee made statements during the prosecution of the '589 patent that EOS has indicated it will urge amounted to a disclaimer. Admittedly, during

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(continued...)

function claim by adopting a function different from that explicitly recited in the claim.’ Correctly identifying the claimed function is important, because ‘an error in identification of the function can improperly alter the identification of the structure . . . corresponding to that

prosecution of the '589 patent, the applicant gratuitously stated that temperature control is important for reducing differential shrinkage and growth. (*E.g.*, Dickerson Decl., Ex. 11 at '589 0263, 0264, 0290, 0350).<sup>22</sup> Significantly, however, these gratuitous statements were not made as the basis for distinguishing the cited art, and thus cannot constitute clear disavowal and prosecution disclaimer. *See Cordis Corp.*, 339 F.3d at 1360-61 (finding no "clear and unmistakable" disclaimer because the patent applicant did not suggest a variation in the prior art was the "basis for distinguishing his invention."); *see also Pickholtz v. Rainbow Techs. Inc.*, 284 F.3d 1365, 1373 (Fed. Cir. 2002) (no disclaimer where the patent applicant was "casual and gratuitous" in making arguments to distinguish over the prior art). Instead, the applicant merely touted the additional benefit or goal of the disclosed preferred embodiment that prevents growth. One skilled in the art would understand that preventing growth is distinct from the claimed function of the "temperature control means" limitation because (i) growth results from too much heat (thus requiring heat be removed and not added), and (ii) occurs at a place different (*i.e.*, at the Growth Interface) than the location expressly specified in claim 1 for the recited function (*i.e.*, moderating temperature differences at the Curl Interface).

Indeed, despite the applicant's references to growth, the entire prosecution history for the '589 patent reflects that the scope of the temperature control means limitation does not include the function of preventing "growth" or the disclosed fan and exhaust system that does so. For example, in the December 27, 1994 Office Action, the Examiner rejected the temperature control means limitation based on prior art to Housholder and Arcella et al. on the basis that they

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(continued...)

function."") (quoting *Generation II Orthotics, Inc. v. Medical Tech., Inc.*, 263 F.3d 1356, 1363 (Fed. Cir. 2001).

<sup>22</sup> A chart listing the pertinent statements made to and by the Patent Office during prosecution of the '589 patent is attached as Exhibit 10 to the Dickerson Declaration.

respectively disclose a “heat source”<sup>23</sup> and an “electrical heater 39.”<sup>24</sup> (*Id.* at ‘589 0236-37.)

Significantly, the Examiner did not even mention the fan/exhaust system, or cooling or removing heat, which confirms that he did not view the claim as including either that structure or those functions. *See Rexnord Corp. v. Laitram Corp.*, 274 F.3d 1336, 1347 (Fed. Cir. 2001) (“Furthermore, we may presume that the examiner gave the terms in the proposed claim their ‘broadest reasonable interpretation consistent with the specification,’ since he was obliged to do so.”) (citation omitted).<sup>25</sup>

In sum, the claimed function of the “temperature control means” is exactly what the plain language of the claim says it is, and nothing more: moderating or lessening the temperature difference between unfused powder and fused powder at the Curl Interface by heating the top layer of unfused powder — and not by cooling the part bed or otherwise removing bulk heat.

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<sup>23</sup> In particular, the Examiner admitted that Housholder does not specifically mention a separate temperature control means, but only suggested one: “It would appear that Householder [sic] does not specifically mention that a separate temperature control means is employed. However, Householder [sic] apparently does at least suggest the use of such an expedient in col. 8, lines 28-60.” (Dickerson Decl., Ex. 11 at ‘589 0236.) In fact, Housholder discloses the following: “Instead of using a laser to selectively fuse each layer, a separate mask for each layer and a heat source may be employed.” (*Id.*, Ex. 12 [Housholder], col. 8:28-50). Thus, the heat source in Housholder was an alternative to the laser, and not a means to control curl or growth.

<sup>24</sup> Since Housholder did not specifically mention a separate control means, the Examiner applied *Arcella et al.*: “In any case, *Arcella et al.* clearly disclose (note ref. num. 39, Figures 1, 2, and col. 6, lines 50-64) that it is well-known in the powder fusing art to employ separate temperature control means with the laser for the purpose of ensuring a more uniform temperature and reducing laser energy usage.” (Dickerson Decl., Ex. 11 at ‘589 0236.) In fact, *Arcella et al.* discloses the following: “Heating can be accomplished in many different ways. For example, electrical heater 39 in the drawing may be used to heat the entire fluidized bed or the powder within the bed. It is also possible to heat the fluidized gas, but this will be less efficient.” (Dickerson Decl., Ex. 13 [*Arcella et al.*], col. 6:59-64.)

<sup>25</sup> Because the Examiner did not explicitly refer or even hint to any notion that the claim term should include a limitation (*i.e.*, cooling or removing heat), particularly when rejecting a claim, at most the prosecution history is inconclusive regarding proper claims interpretation, and thus cannot override the plain meaning of the claim language. *Rexnord Corp.*, 274 F.3d at 1346-48.

**B. Under Section 112, Paragraph 6, the Corresponding Structure that Accomplishes the Related Function is the Heater and its Equivalents.**

Having determined the claimed function, the second step of construing the phrase “temperature control means” is to ascertain the corresponding structure identified in the written description that performs the claimed function. *Northrop Grumman*, 325 F.3d at 1352; *Chiuminatta*, 145 F.3d at 1308-09. The written description, however, does not expressly utilize the words “temperature control means.” Rather, the written description states, as noted above, that a mechanism for controlling the temperature of the incoming air that heats the top layer of powder particles to be sintered, can be, for example, a resistance heater. (‘589 patent, col. 6:65-66). By heating the top layer of powder particles to be sintered, the heater heats up the cooler powder particles so as not to pull too much heat from the sintered layer that would otherwise cause that sintered layer to curl. Thus, the heater is the corresponding structure in the specification necessary to perform the claimed function of the temperature control means limitation because it lessens the temperature difference between the unfused powder in a topmost layer of powder and fused powder in the previously sintered layer therebeneath (*i.e.*, at the Curl Interface).

The prosecution history confirms that the corresponding structure of the temperature control means is a heater, and not necessarily the resistance heater disclosed. For example, in the December 27, 1994 Office Action, the Examiner’s comments suggest that the temperature control means and its range of equivalents is not limited to only a resistance heater, and that an induction heater can be used: “In this case, the process as claimed can be practiced by another and materially different apparatus such as one without a controller for the energy source or an apparatus including an induction heater for controlling the powder temperature.” (Dickerson Decl., Ex. 11 at ‘589 0233, ¶ 6.) Moreover, as discussed above, the Examiner rejected the temperature control means limitation based on prior art to Housholder and Arcella et al. (*id.* at



‘589 0236), finding that this prior art disclosed a “heat source” and an “electrical heater,” respectively, and were determined to disclose sufficient structure for the Examiner initially to reject the temperature control means. (*Id.*) In other words, the Examiner construed “temperature control means” to be a heater, and did not require that it necessarily be a resistance heater or that it also include a fan or an exhaust.

Finally, other claims in the ‘589 patent and the doctrine of claim differentiation support finding that the “temperature control means” limitation does not include the fan and exhaust system. For instance, dependent claim 2 adds to the temperature control means of claim 1:

2. The apparatus of claim 1, wherein said temperature control means comprises:
  - a heater for heating a gas; and
  - means for directing the heated gas at the target surface.

Thus, claim 2 adds limitations to the temperature control means not required by claim 1, such as a particular type of heater that heats a gas and a means for directing the heated gas. And claim 3 expressly adds the exhaust limitation. EOS’s contention that claim 1 must also include the fan and exhaust would render claims 1, 2 and 3 redundant and of the exact same scope, thus violating the doctrine of claim differentiation.

In sum, under the dictates of Section 112, paragraph 6, the “temperature control means” limitation should be construed as referring to a heater and its equivalents.<sup>26</sup>

## VI. CONCLUSION

For each of the reasons set forth above, UT and 3D Systems respectfully request that the Court adopt the claim constructions proposed above and as shown in attached Exhibit A.

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<sup>26</sup> A *Markman* finding that this claim limitation means the heater disclosed in the ‘589 and its “equivalents” does not reach the question — which is properly presented to a jury — of whether the EOS accused devices contain such an equivalent and thus infringe the ‘589 patent.



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*Philip E. Cook, by permission*

PHILIP E. COOK (admitted *pro hac vice*)

Calif. State Bar No. 149067

ROBERT W. DICKERSON (admitted *pro hac vice*)

Calif. State Bar No. 89367

JONES DAY

555 West Fifth Street, Suite 4600

Los Angeles, CA 90013-1025

Telephone: (213) 489-3939

Facsimile: (213) 243-2539

ALAN D ALBRIGHT

Federal Bar No. 13048

Texas State Bar No. 00973650

ELIZABETH J. BROWN FORE

Texas State Bar No. 24001795

GRAY, CARY, WARE & FREIDENRICH LLP

1221 South MoPac Expressway, Suite 400

Austin, TX 78746-6875

Telephone: (512) 457-7000

Facsimile: (512) 457-7001

Attorneys for Plaintiffs

BOARD OF REGENTS, THE

UNIVERSITY OF TEXAS SYSTEM,

and 3D SYSTEMS, INC.

**CERTIFICATE OF SERVICE**

I hereby certify that a true and correct copy of the foregoing document was served in the following manner to the following counsel of record on this 27th day of October, 2003.

Thomas H. Watkins  
Albert A. Carrion, Jr.  
HILGERS & WATKINS P.C.  
98 San Jacinto Boulevard  
San Jacinto Center, Suite 1300  
Austin, Texas 78701  
(512)476-4716  
(512) 476-5139 Facsimile

*Via Certified Mail*

Michael H. Baniak  
Michael D. Gannon  
BANIAK PIKE & GANNON  
150 N. Wacker Drive, Suite 1200  
Chicago, Illinois 60606  
(312) 673-0360  
(312) 673-0361 Facsimile

*Via Federal Express and Electronic Mail*

Attorneys for Defendant  
EOS GMBH ELECTRO OPTICAL SYSTEMS

  
ELIZABETH J. BROWN FORE

**Claim Construction Chart of Board of Regents, the University of Texas System,  
and 3D Systems, Inc.**

**Claim 1 of U.S. Patent No. 5,639,070**

<b>CLAIM LANGUAGE:</b>	<b>PLAINTIFFS' PROPOSED CONSTRUCTION</b>
<p>1. A method of producing a part from a powder, comprising the steps of:</p> <p style="padding-left: 40px;">depositing a first layer of the powder at a target surface;</p> <p style="padding-left: 40px;">directing energy at selected locations of said first layer of powder corresponding to a first cross-section of the part to fuse the powder threat, with unfused portions of the first layer of powder remaining in place;</p> <p style="padding-left: 40px;">depositing a second layer of powder over both fused and remaining unfused portions of said first layer of powder after said directing step, so that the second layer of powder is supported by fused and remaining unfused portions of said first layer of powder;</p> <p style="padding-left: 40px;">after the depositing step, <b>heating the second layer of powder to a temperature below the sintering temperature of the powder, to moderate a temperature difference between the second layer of powder and fused portions of the first layer of powder therebeneath;</b> and</p> <p style="padding-left: 40px;">directing energy at selected locations of said second layer of powder corresponding to a second cross-section of the part to fuse the powder threat, and so that fused powder at one of said selected locations of said second layer of powder fuses to fused powder in said first layer.</p>	<p>adding heat to increase the temperature of the second or newly deposited layer of powder to a temperature below the sintering temperature of the powder, to moderate or lessen a temperature difference between the second or newly deposited layer of powder and the fused portions of the layer of powder directly beneath</p>

## Claim 1 of U.S. Patent No. 5,597,589

CLAIM LANGUAGE:	PLAINTIFFS' PROPOSED CONSTRUCTION
<p>1. An apparatus for producing a part from a powder, comprising:</p> <p>means for successively dispensing a plurality of layers of powder at a target surface;</p> <p>an energy source;</p> <p>a controller for directing the energy source at locations of each dispensed layer of powder at the target surface corresponding to cross-sections of the part to be produced therein and fusing the powder thereat; and</p> <p><b>temperature control means for moderating the temperature difference between unfused powder in a topmost layer of powder at the target surface and fused powder in the one of the plurality of layers of powder immediately beneath the topmost layer.</b></p>	<p>a heater and equivalents that increase the temperature of the unfused powder in a topmost layer of powder at the target surface to moderate or lessen the temperature difference between the unfused powder in the topmost layer of powder and fused powder in a layer immediately below</p>